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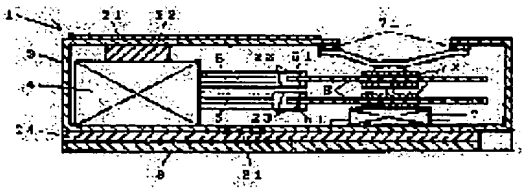
(71)Applicant : NITTO DENKO CORP
(72)Inventor : TAKAHASHI NOBUYUKI
MATSUNAGA MANABU
KITAI HIDEYUKI
SUGIHARA YASUNORI
TANAKA KAZUMASA

(54) VIBRATION REDUCING METHOD AND DISK DRIVE

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a disk drive prevented in occurrence of sound leakage and read/write error by applying a vibration reducing method excellent in vibration reducing performance, showing advanced sound insulating and vibration control functions and easily applicable even to limited space.
SOLUTION: A vibration reducing method is provided wherein a vibration generator 1 has vibration reducing materials 21, 22, 23, and 24 placed in the interior or around the outer periphery. A compressible porous member with an air permeability from 1 × 1/1010 to 2 × 1/102 cc/cm2/sec based on atmospheric pressure difference of 2.039 × 1/104 mmH2O, or a film layer-provided porous member with an absolute value of characteristic impedance at 800 kg/m2.S or more in a 1 to 3 kHz frequency zone is applied as the vibration reducing material. This disk drive is provided with a motor 7 for rotating an information recording media disk 6, and a casing disposed with vibration reducing materials in the interior and/or around the outer periphery, having enough space for attaching the disk 6 at the least.



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CLAIMS

[Claim(s)]
[Claim 1] Arrange oscillating reduction material on the interior or the periphery of a vibration generator system, and the quantity of airflow based on the atmospheric-pressure difference of 2.039x1/104mmH2O as the oscillating reduction material in a 1x1/1010 - 2x1/102 cc/cm2/second And the oscillating reduction approach characterized by using the thing which prepared the film layer in the compressive porosity member, or the thing by which the absolute value of a characteristic impedance prepared the film layer in the porosity member 800 kg/m2 and more than S in the 1-3kHz frequency domain.
[Claim 2] The oscillating reduction approach using what prepared the film layer with a thickness of 5-200 micrometers to which an attenuation coefficient alpha sets a frequency to f, and becomes the porosity member of alpha>=0.01 fneper/m from the polymer of a polyester system, a polyethylene system, a polyamide system, a polyimide system, a polystyrene system, or a vinyl chloride system as oscillating reduction material in claim 1 in the frequency domain whose acoustic absorptivity with a frequency of 3.15kHz is 20% or more or 1-3kHz.
[Claim 3] The in claim 1 or 2, vibration generator system is disk drive which makes disk rotate, and using porosity member of repulsion stress [at the time of 50% compression] 10 - 200 gf/cm2 oscillating [oscillating reduction material] reduction approach.
[Claim 4] It comes to arrange oscillating reduction material on both the interior of a housing or the peripheries which have at least the space which equips the motor for making the disk of an information record medium rotate, and can equip with said disk. [both / one side or] The quantity of airflow based on the atmospheric-pressure difference of 2.039x1/104mmH2O in the oscillating reduction material in a 1x1/1010 - 2x1/102 cc/cm2/second And the thing which has a film layer in a compressive porosity member or the disk drive characterized by consisting of that to which the absolute value of a characteristic impedance has a film layer in the porosity member 800 kg/m2 and more than S in a 1-3kHz frequency domain.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention reduces the vibration accompanying the rotation drive of a disk, demonstrates the advanced sound isolation effectiveness, the vibration-deadening effectiveness, etc., and relates to the suitable oscillating reduction approach for formation of drives, such as a disk for information record, etc.
[0002]
[Description of the Prior Art] In HDD (hard disk drive) in a personal computer etc., DVDD (digital video disk drive) and CDD (compact disk drive), or MOD (MO drive) and FDD (floppy disk drive), in order to prevent propagation of vibration of noise, such as a swish at the time of carrying out the rotation drive of the disk as information record media, such as optical [those / magnetic type, optical, etc.], and a motor, the cure which arranges oscillating reduction material is taken against every place between the body of a drive, and a substrate etc.
[0003] The thing using the oscillating reduction material which consists of what limited foam and its ** load rates, such as polyurethane foam, the thing which attached the polymer film of detailed irregularity to the cellular internal surface of foam, a thing which covered the outside surface with the film, and a thing which carried out the laminating of the melt blow layers, such as resin, to the film as the aforementioned disk drive etc. conventionally was known (JP,56-157347,A, JP,59-102294,A, JP,4-40381,A, JP,4-345834,A, JP,7-261768,A).
[0004] However, there was a trouble of generating it being deficient in the oscillating reduction ability by the oscillating reduction material, and being deficient in the silencing effect and the prevention effectiveness of the propagation of vibration by sound isolation, noise insulation, absorption of sound, vibration deadening, vibrationproofing, etc. even if it is in which the conventional disk drive etc., and a leakage sound being loud, and a lead write error, and by the attachment object of the polymer film of detailed irregularity, the production process was also complicated and the scarce trouble etc. was in manufacture effectiveness.
[0005]
[The technical technical problem of invention] This invention makes it a technical problem to excel in oscillating reduction ability, to show an operation of advanced sound isolation, vibrationproofing, etc., to acquire the oscillating reduction approach easily applicable to narrow space etc., and to obtain the disk drive which prevented generating of a leakage sound or a lead write error.
[0006]
[Means for Solving the Problem] This invention arranges oscillating reduction material on the interior or the periphery of a vibration generator system, and the quantity of airflow based on the atmospheric-pressure difference of 2.039x1/104mmH2O is a 1x1/1010 - 2x1/102 cc/cm2/second as the oscillating reduction material. And the oscillating reduction approach characterized by using the thing which prepared the film layer in the compressive porosity member, or the thing by which the absolute value of a characteristic impedance prepared the film layer in the porosity member 800 kg/m2 and more than S in

the 1-3kHz frequency domain is offered.
[0007] Moreover, this invention equips the motor for making the disk of an information record medium rotate. And it comes to arrange oscillating reduction material on both the interior of a housing or the peripheries which have at least the space which can equip with said disk. [both / one side or] The quantity of airflow based on the atmospheric-pressure difference of 2.039x1/104mmH2O in the oscillating reduction material in a 1x1/1010 - 2x1/102 cc/cm2/second And in the thing which has a film layer in a compressive porosity member, or a 1-3kHz frequency domain, the disk drive characterized by consisting of that to which the absolute value of a characteristic impedance has a film layer in the porosity member 800 kg/m2 and more than S is offered.
[0008]
[Effect of the Invention] The oscillating reduction ability which was excellent with the porosity member which shows the aeration property and the impedance characteristic of the above [oscillating reduction material] according to this invention can demonstrate, an advanced silencing effect, the vibrationproofing effectiveness, etc. which demonstrated the effect of intercepting noise, the propagation-of-vibration inhibition effectiveness, etc. excelled by the film layer, and engine performance, such as the sound isolation, absorption of sound and noise insulation, vibration deadening, and vibrationproofing, compounded can be shown, and the noise abatement, the vibration isolation, etc. which was excellent in vibration generator systems, such as a disk drive, can attain.
[0009] Moreover, the wearing workability which is excellent in manufacture effectiveness, and handling nature improved and excelled that oscillating reduction material consists of a porosity member and a film layer in the reinforcement effectiveness by the film layer is shown, the variation in engine performance, such as sound isolation and vibrationproofing, can control, it can excel to the stability and the dependability of prevention processings, such as the noise and vibration, it can equip easily to narrow space etc., and enlargement of the whole equipment by thick-izing of oscillating reduction material can control.
[0010] In the above, the acoustic absorptivity by the frequency of 3.15kHz sets a frequency as 20% or more of porosity member, an attenuation coefficient sets to f, when it is the oscillating reduction material using the porosity member of 0.01 or more fneper/m, effectiveness, such as silence and vibrationproofing, can improve by leaps and bounds, and more advanced noise abatement, vibration isolation, etc. can be attained. Moreover, when the repulsion stress at the time of 50% compression uses the porosity member of 10 - 200 gf/cm2, narrow space etc. can be equipped more easily, preventing deformation of a contiguity member etc., and manufacture is also easy.
[0011]
[Embodiment of the Invention] The oscillating reduction approach by this invention arranges oscillating reduction material on the interior or the periphery of a vibration generator system. As the oscillating reduction material The quantity of airflow based on the atmospheric-pressure difference of 2.039x1/104mmH2O in a 1x1/1010 - 2x1/102 cc/cm2/second And the thing which prepared the film layer in the compressive porosity member, or the thing by which the absolute value of a characteristic impedance prepared the film layer in the porosity member 800 kg/m2 and more than S in the 1-3kHz frequency domain is used.
[0012] The vibration generator system 1 which enforced the oscillating reduction approach by this invention to drawing 1 , drawing 2 (a), and (b) was illustrated. Moreover, the oscillating reduction material used for drawing 3 (a) and (b) in this invention was illustrated. 2, 21, 22, 23, and 24 are oscillating reduction material, and 25 and 27 are [a film layer and 26] porosity members. In addition, drawing 1 illustrates HDD, and drawing 2 expands and shows the suspension 51 which is the component part.
[0013] The oscillating reduction material to be used attaches the film layers 25 and 27 to one side or both sides of the porosity member 26 which show the property described above like the example of drawing 3 . The effectiveness of having excelled by this, such as absorption of sound, noise insulation, ******, and vibration deadening, is demonstrated, and advanced noise abatement, propagation prevention of vibration, etc. are attained. Namely, although the aforementioned porosity member

absorbs vibrational energy, such as a sound which carried out incidence to it, changes it into heat energy etc. and effectiveness, such as silence and vibration isolation, is demonstrated In that case, by using what shows the above-mentioned quantity of airflow thru/or the above-mentioned impedance characteristic, vibration which reflects vibration of the sound which cannot be absorbed inside a porosity member, and begins to leak outside is controlled greatly, the outstanding oscillating reduction effectiveness etc. is demonstrated, and advanced noise abatement, propagation prevention of vibration, etc. are attained.
[0014] In the above, the quantity of airflow concerned of a porosity member is lacking in the absorptivity of vibration at under a 1x1/1010 cc/cm2/second, if it is hard to discover effectiveness, such as silence and vibrationproofing, and a 2x1/102 cc/cm2/second is exceeded, it is deficient in effectiveness, such as noise insulation, propagation inhibition, etc. by reflection, it is easy to penetrate vibration and it leaks out, and there are much sound and propagation of vibration and it is hard to discover effectiveness, such as silence and vibrationproofing, too. It is also the same as when the impedance characteristics concerned are under 800 kg/m2 and S. Therefore, the above-mentioned limitation of quantity of airflow or an impedance characteristic shows a criticality effectiveness difference in absorption, transparency, or propagation of vibration, such as a sound.
[0015] Therefore, proper things, such as foam, such as the fiber aggregate which shows the above-mentioned property, for example, collects proper fiber natural, organic [composite], and inorganic in the shape of a nonwoven fabric etc., and becomes as a porosity member or an olefin system and an urethane system, acrylic and a vinyl chloride system, an SBR system and NR system, NBR systems, and those blend systems, can be used.
[0016] The quantity of airflow concerned is [the thing of a 1x1/108 - 1.5x1/102 cc/cm2/second, especially a 1x1/106 - 1x1/102 cc/cm2/second or/and the absolute value of the impedance characteristic concerned of especially the porosity member that can be used more preferably than the point of engine performance, such as silence and vibrationproofing, etc.] the thing of 2000 - 13000 kg/m2 and S more than 1200 kg/m2 and S above all more than 1000 kg/m2 and S. Oscillating reduction material may be formed as two or more sorts of layered products, mixolimnions, etc. of a porosity member. In addition, as for foam, it is more desirable than points, such as effectiveness, such as sound isolation and vibrationproofing, and deformation prevention, that 30% or more of a cel is open cell system structure.
[0017] The porosity members which can be used more preferably than points, such as the above-mentioned conditions, are the copolymer which uses as a component the annular or non-annular polyene which has a disconjugation double bond like the alpha olefin like ethylene, a propylene, or butene-1 and a dicyclopentadiene, or ethylidene norbornene, and EPDM system foam which 45-70 mol % and 5-20 mol % of the thing of alpha olefins of ethylene especially of polyenes, and Mooney viscosity ML 1+2 (100 degrees C) become from the thing of 30-110 above all. [% and 50-10 mol
[0018] Moreover, the rubber system foam which used above EPDM together can also be used preferably. In this case, as rubber components other than EPDM, proper things, such as natural rubber, isobutylene isoprene rubber, chloroprene rubber and acrylic rubber, styrene-butadiene rubber, and nitril butadiene rubber, can be used, for example. In addition, as for the amount of EPDM used, it is more desirable than points, such as weatherability and endurance, that they are 20% of the weight or more of all rubber components.
[0019] Manufacture of foam, such as an EPDM system which satisfies the conditions in this invention, can be performed by the approach of performing physical-properties accommodation processing of carrying out foam breaking of a part or all of a cel with proper means, such as compression processing, etc., after fabricating on a sheet etc. the admixture which blended proper additives, such as a foaming agent and a vulcanizing agent, for example, with the rubber component and carrying out foaming vulcanization.
[0020] As the aforementioned foaming agent, proper things, such as an AZOJI carvone amide, dinitrosopentamethylenetetramine and a sodium hydrogencarbonate, an azo system like a 4 and 4'-oxy-screw (benzenesulphonyl semicarbazide), N-nitroso **, an inorganic system and a semicarbazide system, other hydrazine systems, and a triazole system, can be used, for example. The amount of the foaming agent used has per [5] rubber component 100 weight section - 50 weight sections more

desirable than points, such as expansion ratio for acquiring the target physical properties.
[0021] Moreover, as a vulcanizing agent, proper things, such as a sulfur, P-quinonedioxime, P, and P'-dibenzoyl quinonedioxime, 4, 4'-JICHIOJI morpholine, P-dinitroso benzine and ammonium benzoate, N, and N'-m-phenylenedimaleimide, can be used. The amount of the vulcanizing agent used has per [1] rubber component 100 weight section - 30 weight sections more desirable than the point of having prevented foaming inhibition of under cure, outgassing, etc. and of acquiring the physical properties made into the purpose etc.
[0022] preparation of the above-mentioned admixture -- facing -- **** of for example, a urea system, a salicylic-acid system, or a benzoic-acid system -- **** of a proper foaming assistant, an aldehyde ammonia system and an aldehyde amine system, a thiourea system and a guanidine system, a thiazole system and a sulfenamide system, a thiuram system and a dithiocarbamate system, and a xanthate system -- a proper vulcanization assistant can be used if needed.
[0023] Moreover, for example, additives which consist of a calcium carbonate, talc, clay, mica powder, a metal hydroxide like an aluminum hydroxide or a magnesium hydroxide, an aluminum oxide, the metallic oxide like a zinc oxide, etc., such as softeners, such as a bulking agent, paraffin series and a naphthene, an aroma system, and an asphalt system, can also be blended if needed on the occasion of preparation of admixture.
[0024] In the above, the amount of the bulking agent used has per [30] rubber component 100 weight section - the 300 weight sections more desirable than points, such as strong physical-properties control. Moreover, the amount of the softener used has per [10] rubber component 100 weight section - the 300 weight sections more desirable than points related to fizz, such as accommodation of the viscosity of admixture, and the tightness of a blooming.
[0025] As foam, such as the above-mentioned EPDM system used for this invention, admixture is developed by the thickness of 0.5-50mm, for example on a separator, it is heat-treated for 10 - 60 minutes at the temperature of 100-200 degrees C, and what carried out foaming vulcanization so that it might become eight to 13 times especially can use one 3 to 30 times the expansion ratio of this preferably five to 15 times above all. If compression repulsive force may be large, and the arrangement to narrow space etc. may be difficult for expansion ratio in less than 3 times and it exceeds 30 times, engine performance which control of quantity of airflow or a characteristic impedance becomes difficult, and can be satisfied, such as sound isolation and vibrationproofing, may not be obtained.
[0026] Moreover, the thing which consists of proper rubber system polymers, such as proper thermoplastics, such as polyurethane, polyethylene, and a polyvinyl chloride, isobutylene isoprene rubber, and polyisoprene rubber, etc. as a porosity member which can be preferably used in this invention and which specific gravity made the thing of 0.01 to 0.9, the aeration property which proper resin, such as acrylic, the poly butyral system, and a polyester system, was infiltrated into the continuous foam system foam of 0.016-0.1 above all, and was described above, or an impedance characteristic is raised. in that case -- although the amount of sinking in of resin can be suitably determined according to an aeration property etc. -- general -- 0.01 - 1.0 g/cm3 -- it considers as about three 0.02 - 0.1 g/cm above all.
[0027] moreover, a being [the value / 20% or more / above all / 25% or more / especially 30% or more]-based on acoustic absorptivity according [the porosity member which can be used in this invention more preferably than the point of effectiveness, such as silence and vibration deadening, etc.] to frequency of 3.15kHz thing or/and a 1.0-3.0kHz frequency domain -- setting -- an attenuation coefficient -- alpha and a frequency -- f -- carrying out -- formula: -- 0.02 fneper/m<=alpha <=2 fneper/m is satisfied above all alpha>=0.01 fneper/m.
[0028] although the porosity member which can furthermore be used in this invention more preferably than points, such as wearing nature to narrow space etc., was illustrated above, it is needed -- although it is what shows compressibility -- as the compressibility -- the repulsion stress at the time of 50% compression -- 10 - 200 gf/cm2 -- 20 - 150 gf/cm2 and the thing which shows the compression property of 30 - 120 gf/cm2 especially are especially desirable above all.
[0029] The gestalt of a porosity member, as a result the gestalt of oscillating reduction material can be

suitably determined according to the purposes of use, such as an application part, etc., and the thickness is also arbitrary. Generally, based on appearance thickness, 0.5-70mm is especially cost by a porosity member thru/or oscillating reduction material with a thickness of 1-40mm above all 100mm or less. In addition, a porosity member thru/or oscillating reduction material do not need to be homogeneity thickness, and thickness may differ partially.

[0030] The porosity member from which thickness differs partially, as a result oscillating reduction material can be efficiently formed with the method which applies adhesives to the front face, and fills up with and presses into predetermined metal mold the chip which ground for example, the porosity member in the shape of a flake, and produced it.

[0031] The film layer prepared in a porosity member reinforces the free-standing fall by the lamination of a porosity member. Prevent generating of wearing troubles, such as a chip box knee, and the operability and efficiency of wearing are raised. The variation of engine performance, such as decline in working efficiency, sound isolation by the variation in a wearing condition, and vibrationproofing, by wearing mistake etc. is controlled, workability is raised by leaps and bounds, and it aims at attaining processing of advanced and homogeneous sound isolation, vibrationproofing, etc. efficiently. Moreover, also let it be the purpose to give the effectiveness of interrupting vibration of the sound generated inside the device and reducing the exsorption and the propagation to the exterior, such as noise insulation and propagation inhibition, to a film layer, and to excel in it by the sound isolation engine performance, vibration-proof ability, etc.

[0032] A film layer can be prepared in some or all of one side of a porosity member, or both sides, and may be prepared in the envelopment gestalt including all or some of side faces of a porosity member. A method with the adhesion method through adhesives thru/or a binder, etc. of a film, proper thermal melting arrival method, formation method of the film layer by spreading of a polymer solution, etc. can perform the attachment of a film layer. In that case, you may paste up partially to a porosity member, for example, in the case of the porosity member of a thick difference etc., the film layer does not need to be pasted up extensively.

[0033] A film layer can be formed in proper polymers, such as what was illustrated by the above-mentioned porosity member, and there is especially no limitation about the class. Generally, polymers, such as polyolefine systems, such as a polyester system, and polyethylene, polypropylene, a polyamide system and a polyimide system, a polystyrene system, and a vinyl chloride system, a fluorine system, are used. What is excellent in slipping nature etc. is more desirable than points, such as wearing workability. Moreover, a polyester system polymer etc. is more desirable than points, such as workability and harmful gas tightness at the time of heating.

[0034] The quantity of airflow of a film layer more desirable than the points aiming at improvement in effectiveness, such as sound isolation and vibrationproofing, etc., such as insulation and the propagation inhibition nature of vibration, is as follows [a 0.01 cc/cm2/second] based on the atmospheric-pressure difference of 2.039x1/104mmH2O. Moreover, although the film layer may contain the additive illustrated by the above-mentioned porosity member for the proper purpose, it is effective in the sound leakage by noise insulation or vibration-deadening operation, improvement in the tightness of the propagation of vibration, etc. [of the increment in weight by the content]

[0035] In addition, although we are anxious about vibration of a sound etc. not carrying out incidence to a porosity member by the above mentioned noise insulation or the above mentioned vibration-deadening effectiveness in the case of the oscillating reduction material which prepared the film layer in both sides of a porosity member, but neither sound isolation nor the vibrationproofing effectiveness being demonstrated The film layer by the side of sources of an oscillation, such as a noise source, cannot influence substantially easily the operation effectiveness which is the thing of extent which can disregard the existence from a mass law, and was described above from it being close with the source of an oscillation, and vibrating in one.

[0036] Therefore, in the case of the oscillating reduction material which has a film layer only on one side of a porosity member, any of the front flesh side may be arranged as a source side of an oscillation. Generally, it is arranged so that a porosity member may become the source side of an oscillation. In

addition, about the film layer which becomes the source side of an oscillation, reduction processing of proper insulation, such as the thin-film-izing and porosity-izing by punching, or propagation-of-vibration inhibition nature can also be performed.

[0037] About the thickness of a film layer, there is especially no limitation and it can be determined suitably. Especially generally let 8-150-micrometer 5-200 micrometers above all be the thickness of 25-125 micrometers from points, such as the reinforcement effectiveness and lamination of oscillating reduction material. When preparing a film layer in the front flesh side of a porosity member, the quality of the material, thickness, etc. of these films layer may be the same, and may differ from each other.

[0038] In addition, as for the oscillating reduction material applied to a disk drive etc., it is desirable that it is what cannot generate corrosive gas easily. Incidentally by the silicone system polymer, there is a possibility that the volatile component may vapor-deposit on a disk, and may induce disk destruction by change of contact resistance with a slider with a magnetic disk. Therefore, as for the porosity member which forms oscillating reduction material, or a film layer, it is desirable to be formed for materials, such as gas and a silicone free-lancer who cannot generate corrosive gas easily above all.

[0039] The above-mentioned oscillating reduction material is arranged on the interior or the periphery of a vibration generator system, vibration generated from equipment through functions, such as sound isolation and absorption of sound of the oscillating reduction material, noise insulation, vibration deadening, and vibrationproofing, or the function which they compounded is decreased, and the oscillating reduction approach by this invention attains reduction processing of various kinds of propagation of vibration, such as silence and vibrationproofing.

[0040] Therefore, it is preferably applicable to the tape recorder which minded the disk drive, the magnetic tape, etc. taking advantage of the advantage etc. especially from the oscillating reduction material used as described above demonstrating the oscillating reduction ability excellent also in the thin light weight, being excellent in handling nature, and being able to apply also to narrow space easily, although there is especially no limitation about the vibration generator system which applies this invention approach etc.

[0041] The space which especially limitation does not have, for example, can equip with the required number of one sheet or two sheets or more of the disk as an information record medium etc. about the aforementioned disk drive to the interior or the exterior of a housing which it has at least You may be the proper thing it was made to drive a disk through a proper drive like HDD which equips the motor for making a disk rotate, and records or reproduces optical or magnetic information, DVDD and CDD, MOD, FDD, etc.

[0042] In the above oscillating reduction material For example, a sound insulating material, acoustic material, an insulator, a sound deadener and a vibroisolating material, Or for the purpose of reduction processing of various kinds of propagation of vibration which applied to the former correspondingly as those compound functional material etc. It forms in a predetermined gestalt beforehand. Mediation of a between [a drive body and the member of the various kinds between substrates etc.], and the restoration to the opening inside equipment, Although formed the shape of a tape, in the shape of a sheet, etc., it can arrange by the proper method like volume attachment, attachment, etc. on equipment, its components, etc. in the proper location of one place or two places or more of the interior of a vibration generator system thru/or its housing, one side of a periphery, or both.

[0043] In HDD of drawing 1 incidentally described above, 21, 22, 23, and 24 are oscillating reduction material, and it 21 which has been arranged on the periphery of a housing 3 aims at the vibrationproofing sound isolation to vibration spread to the housing. Moreover, the thing 22 arranged between a housing 3 and the upper part of the voice coil motor unit 4 mainly aims at vibrationproofing of vibration by the voice coil motor. In addition, although the gap of a housing and said unit upper part has 2-5 commonmm, it is not limited to this.

[0044] As furthermore shown also in drawing 2 , the oscillating reduction material 23 arranged to the suspension 51 attached in the point of an actuator arm 5 is also aimed at vibrationproofing. A suspension equips the magnetic head outside drawing etc., and it moves to a disk 6 through the voice coil motor unit 4 with said arm 5, it changes an R/W location, and it becomes important preventing it vibration. On the

other hand, the oscillating reduction material 24 arranged between a housing 3 and a substrate 8 reduces vibration by the voice coil motor or the spindle motor 7, and mainly aims at sound isolation.
[0045] Although the above-mentioned example showed what has arranged oscillating reduction material in two or more parts for the purpose of vibrationproofing, sound isolation, etc., the location which arranges oscillating reduction material in this invention may not be limited above, but may be only any the one place, and may be a location fewer than the above or many locations.
[0046] Incidentally as arrangement locations other than the above, between the lower part of the voice coil motor unit 4 or/and a spindle motor 7 and housings 3 etc. is raised, for example. This arrangement is effective in prevention of vibration by the motor spreading to a disk 6, the magnetic head, etc., and a lead write error occurring, prevention of the noise by resonance of a housing, etc. In addition, especially the method that arranges the oscillating reduction material 24 between above-mentioned housings 3 and substrates 8 is effective in prevention of the noise by resonance of a housing.
[0047] Moreover, in the example of drawing 1 , although it has equipped with the upper part of a spindle motor 7 in a housing 3 through a damper 71, between a damper part, or this spindle motor upper part and housing, it can replace with the structure of the example of drawing, and the approach by this invention can also be applied. In addition, in drawing 1 , 31 of a sign is the seal tape of the hole prepared in the housing, and 72 is a disk clamp.
[0048]
[Example] An example 1, 2 ethylene 60 mol %, propylene 10 mol %, polyene 30 mol %, the EPDM100 section (the weight section --) of Mooney viscosity ML1+2 (100 degrees C) 65 Below The whiting 200 same section, the paraffin series oil 50 section, The ADCA system organic blowing agent 15 section and the sulfur 2.5 section are kneaded with a kneader. Develop it by the thickness of 10mm on a separator, at 160 degrees C, heat for 30 minutes, carry out foaming vulcanization, and obtain the German bubble system foam it is 8 times whose expansion ratio of this, and it is sliced in thickness of 2mm, after a clearance passes between one third of the rolls of foam thickness. The porosity member of a 1.0x1/104 cc/cm2/second was obtained, and the quantity of airflow (it is below the same) based on the atmospheric-pressure difference of 2.039x1/104mmH2O pasted up the PET film with a thickness of 38 micrometers on the one side through the adhesive layer, and obtained oscillating reduction material.
[0049] Next, the aforementioned oscillating reduction material 24 was installed between the housing 3 of HDD, and the substrate 8, and the disk drive was formed. In addition, the film layer has been arranged so that it may be on a substrate side in the example 1 and it may be on a housing side in the example 2. Moreover, the aforementioned quantity of airflow is JIS. L Using the Flagyl mold testing machine based on 1096, the pressure was set as arbitration, the quantity of airflow was measured, from correlation with the set pressure and quantity of airflow, the approximate expression was drawn, and the quantity of airflow in atmospheric-pressure difference 2.039x1/104mmH2O was computed and calculated.
[0050] The PET film was prepared in both sides of an example 3 porosity member, and also oscillating reduction material was obtained according to the example 1, and the disk drive was formed using it.
[0051] To ether system urethane foam (commercial item) with a specific gravity [example 4 / 0.03] and an appearance thickness of 2mm The impregnant which comes to blend the isocyanate cross-linking agent 10 section is infiltrated into the copolymer 100 section of 95 % of the weight of butyl acrylates, and 5 % of the weight of acrylic acids at a rate of 0.05 g/cm3 based on solid content. The porosity member which heated for 30 minutes and was obtained at 150 degrees C and whose quantity of airflow is a 1.0x1/104 cc/cm2/second was used, and also oscillating reduction material was obtained according to the example 1, and the disk drive was formed using it.
[0052] The disk drive was formed using the porosity member obtained in the example of comparison 1 example 1 as oscillating reduction material as it is.
[0053] The disk drive was formed using the porosity member obtained in the example of comparison 2 example 4 as oscillating reduction material as it is.
[0054] One half of foam thickness was made to set up and pass through between example of comparison 3 rolls, and also according to the example 1, quantity of airflow obtained the porosity member which is a

5.6x1/102 cc/cm2/second, and formed the disk drive, using it as oscillating reduction material.
[0055] One fourth of foam thickness was made to set up and pass through between example of comparison 4 rolls, and also according to the example 1, quantity of airflow obtained the porosity member which is a 4.3x1/1011 cc/cm2/second, and formed the disk drive, using it as oscillating reduction material.
[0056] 0.008 g/cm3 carried out comparatively the amount of example of comparison 5 sinking in, and also according to the example 4, quantity of airflow obtained the porosity member which is a 8.6x1/102 cc/cm2/second, and formed the disk drive, using it as oscillating reduction material.
[0057] 2.0 g/cm3 carried out comparatively the amount of example of comparison 6 sinking in, and also according to the example 4, the quantity of airflow obtained the porosity member of under a measurement limitation (non-permeability), and formed the disk drive, using it as oscillating reduction material.
[0058] It is JIS about the acoustic absorptivity (oscillating reduction ability) of the porosity member obtained in the evaluation trial 1 acoustic-absorptivity examples 1-4 and the examples 1-6 of a comparison. A It measured with the normal incidence sound absorption coefficient measuring device based on 1405.
[0059] The oscillating reduction material obtained in the repulsive force examples 1-4 and the examples 1-6 of a comparison was compressed into 50% of thickness the rate for 100mm/, and the repulsive force after progress was investigated for 10 seconds.
[0060] Lay the disk drive 92 obtained in the example and the example of a comparison like amount drawing 4 of sound reduction on the base 91 established in the non-sound interior of a room, and it was made to drive through a driving source 94, and the microphone 93 has been arranged in the locationmm [of upper parts of drive 92 / 300] (d) Distant, it ****(ed) through the analyzer 95, and the amount of reduction in the A-weighting function overalls value of the noise investigated by making sound level in case there is no oscillating reduction material into criteria (44.6dB).
[0061] The handling nature of oscillating reduction material was investigated in installation of the handling nature above.
[0062] The aforementioned result was shown in Table 1.
[Table 1]

	多孔質部材通気量 (cc／cm²／秒)	吸音率 (%)	反発力 (gf／cm²)	音低減量 (dB)	取扱性
実施例1	1.0×1／10⁴	35	44	8．8	良好
実施例2	1.0×1／10⁴	35	44	8．6	良好
実施例3	1.0×1／10⁴	35	45	9．1	良好
実施例4	1.0×1／10⁴	32	44	8．3	良好
比較例1	1.0×1／10⁴	35	44	8．1	普通
比較例2	1.0×1／10⁴	32	44	7．6	普通
比較例3	5.6×1／10³	35	38	6．4	普通
比較例4	4.3×1／10¹¹	35	250	8．2	不良*1
比較例5	8.6×1／10³	35	52	5．0	普通
比較例6	測定限界未満	28	280	装着不能	−*2

*1: compression repulsive force -- being large -- a substrate -- deformation [*2:compression repulsive force is large and wearing is impossible -- 0063] According to an example 5 and six examples 1, the German bubble system foam it is 6 times whose expansion ratio of this which made the ten sections the loadings of an ADCA system organic blowing agent is obtained. It was sliced in thickness of 2mm, after the clearance passed between one third of the rolls of foam thickness, the porosity member was obtained, the PET film with a thickness of 38 micrometers was pasted up on the one side through the adhesive layer, oscillating reduction material was obtained, and the disk drive was formed using it. In addition, the film layer has been arranged so that it may be on a substrate side in the example 5 and it may be on a housing side in the example 6.

[0064] When the absolute value (Zc) of a characteristic impedance in a 1.0-3.0kHz frequency domain was investigated with the 2 microphone method acoustic-impedance measuring device about the porosity member obtained above, they were 3500kg/m2andS.

[0065] The PET film was prepared in example 7 both sides, and also oscillating reduction material was obtained according to the example 5, and the disk drive was formed using it.

[0066] It was sliced in thickness of 2mm, after the clearance passed between one third of the rolls of foam thickness, it replaced with the example 8ADCA system organic blowing agent, and the German bubble system foam it is 20 times whose expansion ratio using the DPT system organic blowing agent 25 section of this was obtained, Zc obtained the porosity member of 1700 kg/m2 and S, and used it, and also oscillating reduction material was obtained according to the example 5, and the disk drive was formed.

[0067] The pitch diameter of a cel formed the polyester system urethane foam whose example 9 specific gravity is 0.37mm in 0.055, Zc obtained the porosity member of 1100kg[/m] 2 and S, and used it, and also it was sliced in thickness of 2mm, oscillating reduction material was obtained according to the

example 5, and the disk drive was formed.
[0068] The disk drive was formed using the porosity member obtained in the example of comparison 7 example 5 as oscillating reduction material as it is.
[0069] The disk drive was formed using the porosity member obtained in the example of comparison 8 example 8 as oscillating reduction material as it is.
[0070] The disk drive was formed using the porosity member obtained in the example of comparison 9 example 9 as oscillating reduction material as it is.
[0071] About the porosity member (oscillating reduction material) obtained in the evaluation trial 2 attenuation-coefficient alpha examples 5-9 (examples 7-9 of a comparison), the attenuation coefficient in a 1.0-3.0kHz frequency domain was investigated with the 2 microphone method acoustic-impedance measuring device.
[0072] According to the above, repulsive force was investigated about the oscillating reduction material obtained in the repulsive force examples 5-9 and the examples 7-9 of a comparison.
[0073] According to the above, the amount of reduction of the noise was investigated about the disk drive obtained in the amount examples 5-9 of sound reduction, and the examples 7-9 of a comparison.
[0074] It set to the handling nature above and the handling nature at the time of wearing of oscillating reduction material was evaluated.
[0075] The aforementioned result was shown in Table 2. In addition, although the case of 1.0kHz or 3.0kHz was shown about the attenuation coefficient, the attenuation coefficient in the middle frequency domain was a mean value in 1.0kHz and 3.0kHz.
[Table 2]

	Zc (kg/m²·S)	α (neper/m)		反発力 (gf/cm²)	音低減量 (dB)	取扱性
		1kHz	3kHz			
実施例5	3500	35	84	46	6.5	良好
実施例6	3500	35	84	46	6.3	良好
実施例7	3500	35	84	47	6.8	良好
実施例8	1700	26	58	25	3.8	良好
実施例9	1100	23	37	60	3.1	良好
比較例7	3500	35	84	46	5.7	普通
比較例8	1700	26	58	25	3.0	普通
比較例9	1100	23	37	60	2.3	普通

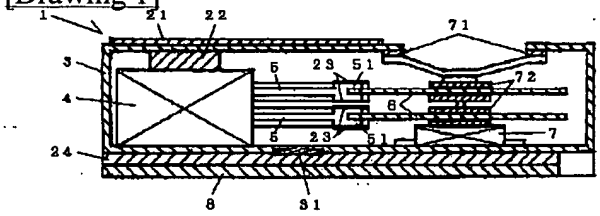
[Translation done.]

* NOTICES *

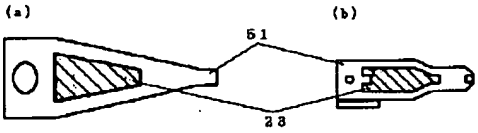
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

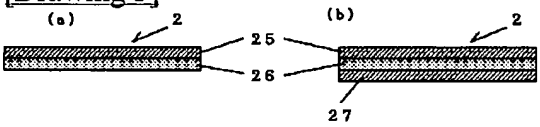
[Drawing 1]



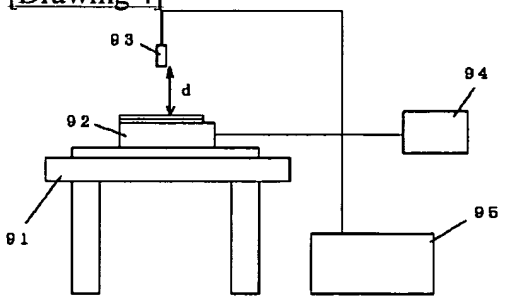
[Drawing 2]



[Drawing 3]



[Drawing 4]



[Translation done.]

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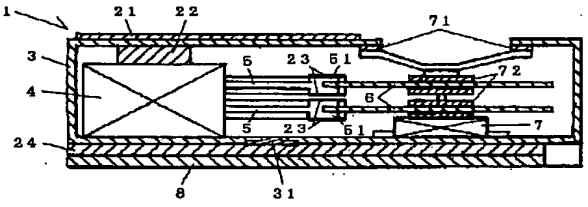
(71)出願人　000003964
日東電工株式会社
大阪府茨木市下穂積１丁目１番２号
(72)発明者　高橋　伸幸
大阪府茨木市下穂積１丁目１番２号　日東電工株式会社内
(72)発明者　松永　学
大阪府茨木市下穂積１丁目１番２号　日東電工株式会社内
(74)代理人　100088007
弁理士　藤本　勉

最終頁に続く

(54)【発明の名称】　振動低減方法及びディスクドライブ

(57)【要約】
【課題】　振動低減能に優れて高度な防音や防振等の作用を示し、狭小空間等にも容易に適用できる振動低減方法を得て、漏れ音やリードライトエラーの発生を防止したディスクドライブ等を得ること。
【解決手段】　振動発生装置１の内部又は外周に振動低減材２１，２２，２３，２４を配置し、その振動低減材として、２．０３９×１／１０^{4}mmH$_2$Oの気圧差に基づく通気量が１×１／１０^{10}～２×１／１０^{2}cc／cm^{2}／秒で、かつ圧縮性の多孔質部材又は１～３ｋＨｚの周波数領域において特性インピーダンスの絶対値が８００kg／m^{2}・S以上の多孔質部材にフィルム層を設けたものを用いる振動低減方法、及び情報記録媒体のディスク６を回転運動させるためのモータ７を装備し、かつ前記ディスクを装着しうる空間を少なくとも有する筐体の内部又は外周の一方又は両方に前記の振動低減材を配置してなるディスクドライブ。



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【特許請求の範囲】

【請求項１】　振動発生装置の内部又は外周に振動低減材を配置し、その振動低減材として、２．０３９×１／１０^{4}mmH$_2$Oの気圧差に基づく通気量が１×１／１０^{10}～２×１／１０^{2}cc／cm^2／秒で、かつ圧縮性の多孔質部材にフィルム層を設けたもの、又は１～３ｋＨｚの周波数領域において特性インピーダンスの絶対値が８００kg／m^2･S以上の多孔質部材にフィルム層を設けたものを用いることを特徴とする振動低減方法。

【請求項２】　請求項１において、振動低減材として、周波数３．１５ｋＨｚでの吸音率が２０％以上、又は１～３ｋＨｚの周波数領域において減衰定数αが周波数をｆとしてα≧０．０１ｆneper／ｍの多孔質部材に、ポリエステル系、ポリエチレン系、ポリアミド系、ポリイミド系、ポリスチレン系又は塩化ビニル系のポリマーからなる厚さ５～２００μｍのフィルム層を設けたものを用いる振動低減方法。

【請求項３】　請求項１又は２において、振動発生装置がディスクを回転運動させるディスクドライブであり、振動低減材が５０％圧縮時の反発応力１０～２００ｇｆ／cm^{2}の多孔質部材を用いたものである振動低減方法。

【請求項４】　情報記録媒体のディスクを回転運動させるためのモータを装備し、かつ前記ディスクを装着しうる空間を少なくとも有する筐体の内部又は外周の一方又は両方に振動低減材を配置してなり、その振動低減材が２．０３９×１／１０^{4}mmH$_2$Oの気圧差に基づく通気量が１×１／１０^{10}～２×１／１０^{2}cc／cm^2／秒で、かつ圧縮性の多孔質部材にフィルム層を有するもの、又は１～３ｋＨｚの周波数領域において特性インピーダンスの絶対値が８００kg／m^2･S以上の多孔質部材にフィルム層を有するものからなることを特徴とするディスクドライブ。

【発明の詳細な説明】

【０００１】

【発明の技術分野】本発明は、ディスクの回転駆動に伴う振動を低減して高度な防音効果や制振効果等を発揮し、情報記録用ディスク等のドライブの形成などに好適な振動低減方法に関する。

【０００２】

【従来の技術】パソコン等におけるＨＤＤ（ハードディスクドライブ）やＤＶＤＤ（デジタルビデオディスクドライブ）、ＣＤＤ（コンパクトディスクドライブ）やＭＯＤ（ＭＯドライブ）、ＦＤＤ（フロッピーディスクドライブ）などでは、それらの磁気式や光学式等の情報記録媒体としてのディスクを回転駆動させる際の風切音等の騒音やモータの振動の伝播を防止するためにドライブの本体と基板間等の各所に振動低減材を配置する対策が講じられている。

【０００３】従来、前記のディスクドライブ等としては、ポリウレタンフォーム等の発泡体やその静バネ定数

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を限定したもの、発泡体の気泡内壁面に微細凹凸のポリマー膜を付設したものや外表面をフィルムで被覆したもの、フィルムに樹脂等のメルトブロー層を積層したものからなる振動低減材を用いたものが知られていた（特開昭５６－１５７３４７号公報、特開昭５９－１０２２９４号公報、特開平４－４０３８１号公報、特開平４－３４５８３４号公報、特開平７－２６１７６８号公報）。

【０００４】しかしながら、従来のいずれのディスクドライブ等にあってもその振動低減材による振動低減能に乏しくて、防音や遮音や吸音、制振や防振等による消音効果や振動伝播の防止効果に乏しく、漏れ音が大きいことやリードライトエラーを発生する問題点があり、また微細凹凸のポリマー膜の付設物等では製造工程も複雑で製造効率に乏しい問題点などもあった。

【０００５】

【発明の技術的課題】本発明は、振動低減能に優れて高度な防音や防振等の作用を示し、狭小空間等にも容易に適用できる振動低減方法を得て、漏れ音やリードライトエラーの発生を防止したディスクドライブ等を得ることを課題とする。

【０００６】

【課題の解決手段】本発明は、振動発生装置の内部又は外周に振動低減材を配置し、その振動低減材として、２．０３９×１／１０^{4}mmH$_2$Oの気圧差に基づく通気量が１×１／１０^{10}～２×１／１０^{2}cc／cm^2／秒で、かつ圧縮性の多孔質部材にフィルム層を設けたもの、又は１～３ｋＨｚの周波数領域において特性インピーダンスの絶対値が８００kg／m^2･S以上の多孔質部材にフィルム層を設けたものを用いることを特徴とする振動低減方法を提供するものである。

【０００７】また本発明は、情報記録媒体のディスクを回転運動させるためのモータを装備し、かつ前記ディスクを装着しうる空間を少なくとも有する筐体の内部又は外周の一方又は両方に振動低減材を配置してなり、その振動低減材が２．０３９×１／１０^{4}mmH$_2$Oの気圧差に基づく通気量が１×１／１０^{10}～２×１／１０^{2}cc／cm^2／秒で、かつ圧縮性の多孔質部材にフィルム層を有するもの、又は１～３ｋＨｚの周波数領域において特性インピーダンスの絶対値が８００kg／m^2･S以上の多孔質部材にフィルム層を有するものからなることを特徴とするディスクドライブを提供するものである。

【０００８】

【発明の効果】本発明によれば、振動低減材が上記の通気特性やインピーダンス特性を示す多孔質部材により優れた振動低減能を発揮し、フィルム層により優れた遮音効果や振動伝播阻止効果等を発揮してその防音や吸音や遮音、制振や防振等の性能が複合した高度な消音効果や防振効果等を示し、ディスクドライブ等の振動発生装置の優れた騒音防止や振動防止等を達成することができる。

【０００９】また振動低減材が多孔質部材とフィルム層よりなることより製造効率に優れ、フィルム層による補強効果で取扱性が向上して優れた装着作業性を示し、防音や防振等の性能のバラツキを抑制できて、騒音や振動等の防止処理の安定性や信頼性に優れ、狭小空間等にも容易に装着できて、振動低減材の肉厚化による装置全体の大型化を抑制することができる。

【００１０】前記において、周波数３．１５ｋＨｚによる吸音率が２０％以上の多孔質部材、ないし減衰定数が周波数をｆとして０．０１ｆneper／m以上の多孔質部材を用いた振動低減材である場合には、消音や防振等の効果が飛躍的に向上して、より高度な騒音防止や振動防止等を達成することができる。また５０％圧縮時の反発応力が１０～２００ｇｆ／cm^2の多孔質部材を用いた場合には、隣接部材の変形等を防止しつつ狭小空間等にもより容易に装着でき、かつ製造も容易である。

【００１１】

【発明の実施形態】本発明による振動低減方法は、振動発生装置の内部又は外周に振動低減材を配置し、その振動低減材として、２．０３９×１／10^4mmH_2Oの気圧差に基づく通気量が１×１／10^{10}～２×１／10^2cc／cm^2／秒で、かつ圧縮性の多孔質部材にフィルム層を設けたもの、又は１～３ｋＨｚの周波数領域において特性インピーダンスの絶対値が８００kg／m^2·S以上の多孔質部材にフィルム層を設けたものを用いたものである。

【００１２】図１、図２（ａ），（ｂ）に本発明による振動低減方法を実施した振動発生装置１を例示した。また図３（ａ），（ｂ）に本発明において用いる振動低減材を例示した。２，２１，２２，２３，２４が振動低減材であり、２５、２７がフィルム層、２６が多孔質部材である。なお図１はＨＤＤを例示したものであり、図２はその構成部品であるサスペンション５１を拡大して示したものである。

【００１３】用いる振動低減材は、図３の例の如く上記した特性を示す多孔質部材２６の片面又は両面にフィルム層２５，２７を付設したものである。これにより優れた吸音や遮音、吸振動や制振等の効果を発揮して高度な騒音防止や振動の伝播防止等が達成される。すなわち前記の多孔質部材は、それに入射した音等の振動エネルギを吸収し熱エネルギ等に変換して消音や振動防止等の効果を発揮するが、その場合に上記した通気量ないしインピーダンス特性を示すものを用いることにより、吸収しきれない音等の振動を多孔質部材の内部で反射して外部に漏れ出す振動を大きく抑制し、優れた振動低減効果等を発揮して高度な騒音防止や振動の伝播防止等が達成される。

【００１４】前記において、多孔質部材の当該通気量が１×１／10^{10} cc／cm^2／秒未満では振動の吸収性に乏しくて消音や防振等の効果が発現しにくく、２×１／10^2cc／cm^2／秒を超えると反射による遮音や伝播阻止等の効果に乏しくて振動が透過しやすく、漏出し音や振動伝播が多くてやはり消音や防振等の効果が発現しにくい。当該インピーダンス特性が８００kg／m^2·S未満の場合も同様である。従って通気量又はインピーダンス特性の上記限定が音等の振動の吸収と透過ないし伝播において臨界的な効果差を示す。

【００１５】よって多孔質部材としては、上記の特性を示す、例えば天然や合成の有機や無機の適宜な繊維を不織布状等に集成してなる繊維集合体、あるいはオレフィン系やウレタン系、アクリル系や塩化ビニル系、ＳＢＲ系やＮＲ系、ＮＢＲ系やそれらのブレンド系等の発泡体などの適宜なものを用いうる。

【００１６】消音や防振等の性能の点などより好ましく用いうる多孔質部材は、当該通気量が１×１／10^8～１．５×１／10^2cc／cm^2／秒、特に１×１／10^6～１×１／10^2cc／cm^2／秒のもの、又は／及び当該インピーダンス特性の絶対値が１０００kg／m^2·S以上、就中１２００kg／m^2·S以上、特に２０００～１３０００kg／m^2·Sのものである。振動低減材は、２種以上の多孔質部材の積層体や混合層などとして形成されていてもよい。なお発泡体は、防音や防振等の効果や変形防止などの点よりセルの３０％以上が連続気泡系構造であることが好ましい。

【００１７】上記した条件等の点より好ましく用いうる多孔質部材は、エチレン、プロピレンやブテン－１の如きα－オレフィン、及びジシクロペンタジエンやエチリデンノルボルネンの如き非共役二重結合を有する環状又は非環状のポリエンを成分とする共重合体、就中エチレン４５～７０モル％、α－オレフィン５～２０モル％、ポリエン５０～１０モル％のもの、特にムーニー粘度ML_{1+2}（１００℃）が３０～１１０のものからなるＥＰＤＭ系発泡体である。

【００１８】また前記のＥＰＤＭを併用したゴム系発泡体も好ましく用いうる。この場合にＥＰＤＭ以外のゴム成分としては、例えば天然ゴムやブチルゴム、クロロプレンゴムやアクリルゴム、スチレン・ブタジエンゴムやニトリル・ブタジエンゴムなどの適宜なものを用いうる。なおＥＰＤＭの使用量は、耐候性や耐久性などの点より全ゴム成分の２０重量％以上であることが好ましい。

【００１９】本発明における条件を満足するＥＰＤＭ系等の発泡体の製造は、例えばゴム成分に発泡剤や加硫剤等の適宜な添加剤を配合した混和物をシート等に成形して発泡加硫処理した後、セルの一部又は全部を圧縮処理等の適宜な手段で破泡させるなどの物性調節処理を施す方法などにより行うことができる。

【００２０】前記の発泡剤としては、例えばアゾジカルボンアミドやジニトロソペンタメチレンテトラミン、炭酸水素ナトリウムや４，４'-オキシビス（ベンゼンスルホニルセミカルバジド）の如きアゾ系やＮ－ニトロソ

系、無機系やセミカルバジド系、その他ヒドラジン系やトリアゾール系などの適宜なものを用いうる。発泡剤の使用量は、目的とする物性を得るための発泡倍率などの点より、ゴム成分１００重量部あたり５～５０重量部が好ましい。

【００２１】また加硫剤としては、硫黄やＰ－キノンジオキシム、Ｐ，Ｐ'-ジベンゾイルキノンジオキシムや４，４'-ジチオジモルホリン、Ｐ－ジニトロソベンジンや安息香酸アンモニウム、Ｎ，Ｎ'-ｍ－フェニレンジマレイミドなどの適宜なものを用いうる。加硫剤の使用量は、加硫不足やガス抜け等の発泡阻害を防止した、目的とする物性を得る点などより、ゴム成分１００重量部あたり１～３０重量部が好ましい。

【００２２】上記した混和物の調製に際しては、例えば尿素系やサリチル酸系や安息香酸系の如き適宜な発泡助剤、アルデヒドアンモニア系やアルデヒドアミン系、チオウレア系やグアニジン系、チアゾール系やスルフェンアミド系、チウラム系やジチオカルバミン酸塩系、キサントゲン酸塩系の如き適宜な加硫助剤を必要に応じて用いうる。

【００２３】また例えば、炭酸カルシウム、タルク、クレー、雲母粉、水酸化アルミニウムや水酸化マグネシウムの如き金属水酸化物、酸化アルミニウムや酸化亜鉛の如き金属酸化物等からなる充填剤、パラフィン系やナフテン系、アロマ系やアスファルト系等の軟化剤などの添加剤も混和物の調製に際し必要に応じて配合することができる。

【００２４】前記において、充填剤の使用量は、強度等の物性制御などの点よりゴム成分１００重量部あたり３０～３００重量部が好ましい。また軟化剤の使用量は、発泡性に関係する混和物の粘度の調節やブルーミングの防止性などの点よりゴム成分１００重量部あたり１０～３００重量部が好ましい。

【００２５】本発明に用いる上記ＥＰＤＭ系等の発泡体としては、例えば剥離ライナ上に混和物を０．５～５０㎜の厚さで展開し、それを１００～２００℃の温度で１０～６０分間加熱処理するなどして、発泡倍率３～３０倍、就中５～１５倍、特に８～１３倍となるように発泡加硫処理したものが好ましく用いうる。発泡倍率が３倍未満では、圧縮反発力が大きくて狭小空間等への配置が困難な場合があり、３０倍を超えると通気量や特性インピーダンスの制御が困難となって満足できる防音や防振等の性能が得られない場合がある。

【００２６】また本発明において好ましく用いうる多孔質部材としては、ポリウレタン、ポリエチレン、ポリ塩化ビニル等の適宜な熱可塑性樹脂や、ブチルゴムやイソプレンゴム等の適宜なゴム系ポリマーなどからなる、比重が０．０１～０．９、就中０．０１６～０．１の連泡系発泡体に、アクリル系やポリブチラール系やポリエステル系などの適宜な樹脂を含浸させて、上記した通気特性やインピーダンス特性のものとしたものなどもあげられる。その場合、樹脂の含浸量は通気特性等に応じて適宜に決定しうるが、一般には０．０１～１．０ｇ／ｃｍ³、就中０．０２～０．１ｇ／ｃｍ³程度とされる。

【００２７】また本発明において、消音や制振等の効果の点などより好ましく用いうる多孔質部材は、周波数３．１５ｋＨｚによる吸音率に基づいてその値が２０％以上、就中２５％以上、特に３０％以上であるのもの、又は／及び１．０～３．０ｋＨｚの周波数領域において、減衰定数をα、周波数をｆとして、式：α≧０．０１ｆneper／ｍ、就中０．０２ｆneper／ｍ≦α≦２ｆneper／ｍを満足するものである。

【００２８】さらに本発明において狭小空間等への装着性などの点より好ましく用いうる多孔質部材は、上記に例示したものの如く圧縮性を示すものであるが、その圧縮性としては５０％圧縮時の反発応力が１０～２００ｇｆ／ｃｍ²、就中２０～１５０ｇｆ／ｃｍ²、特に３０～１２０ｇｆ／ｃｍ²の圧縮特性を示すものが殊に好ましい。

【００２９】多孔質部材の形態、ひいては振動低減材の形態は、適用箇所等の使用目的などに応じて適宜に決定でき、その厚さも任意である。一般には、見掛け厚さに基づいて１００㎜以下、就中０．５～７０㎜、特に１～４０㎜の厚さの多孔質部材ないし振動低減材とされる。なお多孔質部材ないし振動低減材は、均一厚である必要はなく、部分的に厚さが異なっていてもよい。

【００３０】肉厚が部分的に異なる多孔質部材、ひいては振動低減材は、例えば多孔質部材をフレーク状に粉砕するなどして作製したチップを、その表面に接着剤を塗布するなどして所定の金型に充填し圧縮成形する方式などにより効率よく形成することができる。

【００３１】多孔質部材に設けるフィルム層は、多孔質部材の薄層化による自己支持性の低下を補強し、折曲り等の装着トラブルの発生を予防して装着作業の操作性や能率を向上させ、装着ミスによる作業効率の低下や装着状態のバラツキによる防音や防振等の性能のバラツキなどを抑制して作業性を飛躍的に向上させ、高度で均質な防音や防振等の処理を効率的に達成することを目的とする。またフィルム層に機器内部で発生した音等の振動を遮って外部への漏出や伝播を低減する遮音や伝播阻止等の効果を持たせて防音性能や防振性能等により優れるものとすることも目的とする。

【００３２】フィルム層は、多孔質部材の片面又は両面の一部又は全部に設けることができ、多孔質部材の側面の全部又は一部を含む包囲形態に設けられていてもよい。フィルム層の付設は、例えばフィルムの接着剤ないし粘着剤等を介した接着方式や熱融着方式、ポリマー溶液の塗布によるフィルム層の形成方式などの適宜な方式にて行うことができる。その場合、フィルム層は多孔質部材に対し部分的に接着していてもよく、例えば肉厚相違の多孔質部材などの場合に全面的に接着している必要

はない。

【００３３】フィルム層は、上記した多孔質部材で例示したものなどの適宜なポリマーにて形成でき、その種類については特に限定はない。一般には、例えばポリエステル系やポリエチレン、ポリプロピレン等のポリオレフィン系、ポリアミド系やポリイミド系、ポリスチレン系や塩化ビニル系、フッ素系などのポリマーが用いられる。装着作業性等の点よりは、滑り性等に優れるものが好ましい。また加工性や加熱時の有害ガス防止性等の点よりはポリエステル系ポリマーなどが好ましい。

【００３４】防音や防振等の効果の向上などを目的とした遮音性や振動の伝播阻止性などの点より好ましいフィルム層は、通気量が２．０３９×１／１０^{4}㎜H_2Oの気圧差に基づいて０．０１cc／cm^{2}／秒以下のものである。またフィルム層は、上記の多孔質部材で例示した添加剤などを適宜な目的で含有していてもよいが、その含有による重量増加は、遮音や制振作用による漏音や振動伝播の防止性の向上などに有効である。

【００３５】なお多孔質部材の両面にフィルム層を設けた振動低減材の場合、前記した遮音や制振効果にて音等の振動が多孔質部材に入射せず防音や防振効果の発揮されないことが懸念されるが、騒音源等の発振源側のフィルム層は、質量則よりその存在を無視しうる程度のものであり、かつ発振源と密接して一体的に振動することより上記した作用効果には実質的に影響しにくい。

【００３６】従って、多孔質部材の片面のみにフィルム層を有する振動低減材の場合、その表裏のいずれを発振源側として配置してもよい。一般には、多孔質部材が発振源側となるように配置される。なお発振源側となるフィルム層については、その薄膜化や穿孔による多孔化などの適宜な遮音性や振動伝播阻止性の低減処理を施すこともできる。

【００３７】フィルム層の厚さについては特に限定はなく、適宜に決定しうる。一般には、補強効果や振動低減材の薄層化などの点より５～２００μm、就中８～１５０μm、特に２５～１２５μmの厚さとされる。多孔質部材の表裏にフィルム層を設ける場合、それらフィルム層の材質や厚さなどは、同じであってもよいし、異なっていてもよい。

【００３８】なおディスクドライブ等に適用する振動低減材は、腐食性ガスを発生しにくいものであることが好ましい。ちなみにシリコーン系ポリマー等では、その揮発性成分がディスクに蒸着して磁気ディスクではスライダとの接触抵抗の変化でディスク破壊を誘発するおそれがある。従って振動低減材を形成する多孔質部材やフィルム層は、ガス、就中、腐食性ガスを発生しにくいシリコーンフリー等の素材で形成されていることが好ましい。

【００３９】本発明による振動低減方法は、上記した振動低減材を振動発生装置の内部又は外周に配置して、その振動低減材の防音や吸音や遮音、制振や防振等の機能、あるいはそれらが複合した機能を介し装置より発生する振動を低減し、消音や防振等の各種の振動伝播の低減処理を達成するものである。

【００４０】従って本発明方法を適用する振動発生装置については特に限定はないが、上記した如く用いる振動低減材が薄型軽量にても優れた振動低減能を発揮し、取扱性に優れて狭小空間にも容易に適用できることなどより、その利点等を生かしてディスクドライブや磁気テープ等を介したテープレコーダなどに特に好ましく適用することができる。

【００４１】前記のディスクドライブについては、特に限定はなく、例えば情報記録媒体等としてのディスクの１枚又は２枚以上の必要数を装着しうる空間を少なくとも有する筐体の内部又は外部に、ディスクを回転運動させるためのモータを装備して、光学的あるいは磁気的な情報を記録又は再生するＨＤＤやＤＶＤＤ、ＣＤＤやＭＯＤ、ＦＤＤ等の如く、ディスクを適宜な駆動機構を介して駆動するようにした適宜なものであってよい。

【００４２】前記において振動低減材は、例えば防音材や吸音材や遮音材、制振材や防振材、あるいはそれらの複合機能材等として従来に準じた各種の振動伝播の低減処理を目的に、所定の形態に予め形成してドライブ本体と基板間等の各種の部材間への介在や装置内部の空隙への充填、テープ状やシート状等に形成したものの装置やその部品等への巻付けや貼付けなどの如く適宜な方式にて振動発生装置ないしその筐体の内部又は外周の一方又は両方の一箇所又は二箇所以上の適宜な位置に配置することができる。

【００４３】ちなみに上記した図１のＨＤＤでは、２１，２２，２３，２４が振動低減材であり、筐体３の外周に配置したそれ２１は、筐体に伝播した振動に対する防振防音を目的とする。また筐体３とボイスコイルモータユニット４の上部との間に配置したもの２２は、主にボイスコイルモータによる振動の防振を目的とする。なお筐体と前記ユニット上部との間隙は、２～５㎜が一般的であるが、これに限定されない。

【００４４】さらに図２にも示した如く、アクチュエータアーム５の先端部に取り付けられたサスペンション５１に配置した振動低減材２３も、防振を目的とする。サスペンションは、図外の磁気ヘッド等を装備して、ボイスコイルモータユニット４を介し前記アーム５と共にディスク６に対し移動して読み書き位置を変えるものであり、振動の防止が重要となる。一方、筐体３と基板８との間に配置した振動低減材２４は、ボイスコイルモータやスピンドルモータ７による振動を低減して主に防音を目的とする。

【００４５】上記の例では、防振や防音等を目的に複数の箇所に振動低減材を配置したものを示したが、本発明において振動低減材を配置する位置は、上記に限定され

ずそのいずれか一箇所のみであってもよいし、上記より少ない位置あるいは多い位置であってもよい。

【００４６】ちなみに上記以外の配置位置としては、例えばボイスコイルモータユニット４又は／及びスピンドルモータ７の下部と筐体３との間などがあげられる。かかる配置は、モータによる振動がディスク６や磁気ヘッド等に伝播してリードライトエラーが発生することの防止や筐体の共振による騒音の防止などに有効である。なお筐体の共振による騒音の防止には、上記した筐体３と基板８との間に振動低減材２４を配置する方式が特に有効である。

【００４７】また図１の例では、スピンドルモータ７の上方をダンパ７１を介して筐体３内に装着しているが、このダンパ部分やスピンドルモータ上方と筐体の間に図例の構造に代えて本発明による方法を適用することもできる。なお図１において、符号の３１は筐体に設けた孔のシールテープであり、７２はディスククランプである。

【００４８】

【実施例】実施例１、２

エチレン６０モル％、プロピレン１０モル％、ポリエン３０モル％、ムーニー粘度ML_{1+2}（１００℃）６５のＥＰＤＭ１００部（重量部、以下同じ）、重質炭酸カルシウム２００部、パラフィン系オイル５０部、ＡＤＣＡ系有機発泡剤１５部、及び硫黄２．５部をニーダで混練し、それを剥離ライナ上に１０㎜の厚さで展開し、１６０℃で３０分間加熱して発泡加硫し、発泡倍率が８倍の独泡系発泡体を得、それを隙間が発泡体厚の１／３のロール間を通過させた後、２㎜の厚さにスライスして、２．０３９×１／１０^4㎜H_2Oの気圧差に基づく通気量（以下同じ）が１．０×１／１０^{4}cc／cm^2／秒の多孔質部材を得、その片面に厚さ３８μmのＰＥＴフィルムを粘着層を介し接着して振動低減材を得た。

【００４９】次に、前記の振動低減材２４をＨＤＤの筐体３と基板８との間に設置してディスクドライブを形成した。なおフィルム層は、実施例１では基板側、実施例２では筐体側となるように配置した。また前記の通気量は、ＪＩＳ　Ｌ　１０９６に準拠したフラジール型試験機を用い、圧力を任意に設定して通気量を測定し、その設定圧と通気量との相関より近似式を導いて気圧差２．０３９×１／１０^4㎜H_2Oでの通気量を算出して求めた。

【００５０】実施例３

多孔質部材の両面にＰＥＴフィルムを設けたほかは実施例１に準じて振動低減材を得、それを用いてディスクドライブを形成した。

【００５１】実施例４

比重０．０３、見掛け厚さ２㎜のエーテル系ウレタン発泡体（市販品）に、アクリル酸ブチル９５重量％とアクリル酸５重量％の共重合体１００部にイソシアネート系架橋剤１０部を配合してなる含浸剤を固形分に基づいて０．０５ｇ／cm^{3}の割合で含浸させ、１５０℃で３０分間加熱して得た、通気量が１．０×１／１０^{4}cc／cm^2／秒の多孔質部材を用いたほかは実施例１に準じて振動低減材を得、それを用いてディスクドライブを形成した。

【００５２】比較例１

実施例１で得た多孔質部材をそのまま振動低減材として用いてディスクドライブを形成した。

【００５３】比較例２

実施例４で得た多孔質部材をそのまま振動低減材として用いてディスクドライブを形成した。

【００５４】比較例３

ロール間を発泡体厚の１／２に設定して通過させたほかは実施例１に準じて、通気量が５．６×１／１０^{2}cc／cm^2／秒の多孔質部材を得、それを振動低減材として用いてディスクドライブを形成した。

【００５５】比較例４

ロール間を発泡体厚の１／４に設定して通過させたほかは実施例１に準じて、通気量が４．３×１／１０^{11} cc／cm^2／秒の多孔質部材を得、それを振動低減材として用いてディスクドライブを形成した。

【００５６】比較例５

含浸量を０．００８ｇ／cm^{3}の割合としたほかは実施例４に準じて、通気量が８．６×１／１０^{2}cc／cm^2／秒の多孔質部材を得、それを振動低減材として用いてディスクドライブを形成した。

【００５７】比較例６

含浸量を２．０ｇ／cm^{3}の割合としたほかは実施例４に準じて、通気量が測定限界未満（非通気性）の多孔質部材を得、それを振動低減材として用いてディスクドライブを形成した。

【００５８】評価試験１

吸音率

実施例１～４、比較例１～６で得た多孔質部材の吸音率（振動低減能）をＪＩＳ　Ａ　１４０５に準拠した垂直入射吸音率測定装置により測定した。

【００５９】反発力

実施例１～４、比較例１～６で得た振動低減材を１００㎜／分の速度で５０％の厚さに圧縮し、１０秒間経過後の反発力を調べた。

【００６０】音低減量

図４の如く実施例、比較例で得たディスクドライブ９２を無音響室内に設けた台９１の上に載置して駆動源９４を介し駆動させ、ドライブ９２の上方３００㎜（ｄ）離れた位置にマイクロホン９３を配置してアナライザー９５を介し測音し、振動低減材が無い場合の音レベルを基準（４４．６ｄＢ）として騒音のＡ特性オーバーオール値での低減量を調べた。

【００６１】取扱性

前記の設置作業において、振動低減材の取扱性を調べ

た。

【００６２】前記の結果を表１に示した。

【表１】

	多孔質部材通気量（cc／cm²／秒）	吸音率（%）	反発力（gf／cm²）	音低減量（ｄＢ）	取扱性
実施例１	1.0×1／１０⁴	３５	４４	８．８	良好
実施例２	1.0×1／１０⁴	３５	４４	８．６	良好
実施例３	1.0×1／１０⁴	３５	４５	９．１	良好
実施例４	1.0×1／１０⁴	３２	４４	８．３	良好
比較例１	1.0×1／１０⁴	３５	４４	８．１	普通
比較例２	1.0×1／１０⁴	３２	４４	７．６	普通
比較例３	5.6×1／１０³	３５	３８	６．４	普通
比較例４	4.3×1／１０¹¹	３５	２５０	８．２	不良*1
比較例５	8.6×1／１０³	３５	５２	５．０	普通
比較例６	測定限界未満	２８	２８０	装着不能	－*2

＊１：圧縮反発力が大きくて基板が変形

＊２：圧縮反発力が大きくて装着不可

【０００６３】実施例５、６

実施例１に準じて、ＡＤＣＡ系有機発泡剤の配合量を１０部とした発泡倍率が６倍の独泡系発泡体を得、それを隙間が発泡体厚の１／３のロール間を通過させた後、２㎜の厚さにスライスして多孔質部材を得、その片面に厚さ３８μmのＰＥＴフィルムを粘着層を介し接着して振動低減材を得てそれを用いディスクドライブを形成した。なおフィルム層は、実施例５では基板側、実施例６では筐体側となるように配置した。

【０００６４】前記で得た多孔質部材について２マイクロホン法音響インピーダンス測定装置にて、１．０～３．０ｋＨｚの周波数領域における、特性インピーダンスの絶対値（Ｚc）を調べたところ、３５００kg／m²·Sであった。

【０００６５】実施例７

両面にＰＥＴフィルムを設けたほかは実施例５に準じて振動低減材を得、それを用いてディスクドライブを形成した。

【０００６６】実施例８

ＡＤＣＡ系有機発泡剤に代えて、ＤＰＴ系有機発泡剤２５部を用いた発泡倍率が２０倍の独泡系発泡体を得、それを隙間が発泡体厚の１／３のロール間を通過させた後、２㎜の厚さにスライスして、Ｚcが１７００kg／m²·Sの多孔質部材を得てそれを用いたほかは実施例５に準じて振動低減材を得、ディスクドライブを形成した。

【０００６７】実施例９

比重が０．０５５で、セルの平均径が０．３７㎜のポリエステル系ウレタン発泡体を形成し、それを２㎜の厚さにスライスしてＺcが１１００kg／m²·Sの多孔質部材を得てそれを用いたほかは実施例５に準じて振動低減材を得、ディスクドライブを形成した。

【０００６８】比較例７

実施例５で得た多孔質部材をそのまま振動低減材として用いてディスクドライブを形成した。

【０００６９】比較例８

実施例８で得た多孔質部材をそのまま振動低減材として用いてディスクドライブを形成した。

【０００７０】比較例９

実施例９で得た多孔質部材をそのまま振動低減材として用いてディスクドライブを形成した。

【０００７１】評価試験２

減衰定数α

実施例５～９（比較例７～９）で得た多孔質部材（振動低減材）について、２マイクロホン法音響インピーダン

ス測定装置にて、１．０～３．０ｋＨｚの周波数領域における減衰定数を調べた。

【００７２】反発力

実施例５～９、比較例７～９で得た振動低減材について上記に準じ反発力を調べた。

【００７３】音低減量

実施例５～９、比較例７～９で得たディスクドライブについて上記に準じ騒音の低減量を調べた。

【００７４】取扱性

前記において、振動低減材の装着作業時における取扱性を評価した。

【００７５】前記の結果を表２に示した。なお減衰定数については１．０ｋＨｚ又は３．０ｋＨｚの場合を示したが、その中間の周波数領域での減衰定数は、１．０ｋＨｚと３．０ｋＨｚの場合の中間値であった。

【表２】

	Ｚｃ (kg／m²・S)	α (neper／m)		反発力 (gf／cm²)	音低減量 (ｄＢ)	取扱性
		1 kHz	3 kHz			
実施例５	3500	３５	８４	４６	６．５	良好
実施例６	3500	３５	８４	４６	６．３	良好
実施例７	3500	３５	８４	４７	６．８	良好
実施例８	1700	２６	５８	２５	３．８	良好
実施例９	1100	２３	３７	６０	３．１	良好
比較例７	3500	３５	８４	４６	５．７	普通
比較例８	1700	２６	５８	２５	３．０	普通
比較例９	1100	２３	３７	６０	２．３	普通

【図面の簡単な説明】

【図１】振動発生装置例の部分断面説明図

【図２】構成部品の拡大説明平面図

【図３】振動低減材例の断面図

【図４】測音試験の説明図

【符号の説明】

１：振動発生装置

２，２１，２２，２３，２４：振動低減材

２５，２７：フィルム層

２６：多孔質部材

３：筐体

４：ボイスコイルモーターユニット

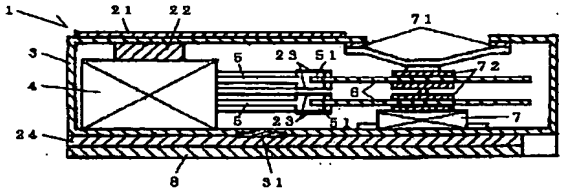
５１：サスペンション

６：ディスク

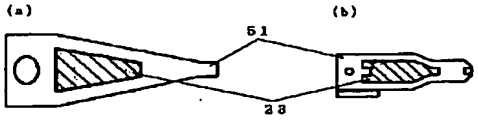
７：スピンドルモータ

８：基板

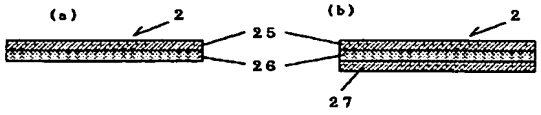
【図１】



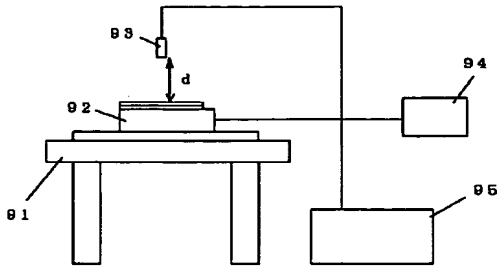
【図２】



【図３】



【図４】



フロントページの続き

(72)発明者　北井　秀幸
大阪府茨木市下穂積１丁目１番２号　日東電工株式会社内

(72)発明者　杉原　保則
大阪府茨木市下穂積１丁目１番２号　日東電工株式会社内

(72)発明者　田中　和雅
大阪府茨木市下穂積１丁目１番２号　日東電工株式会社内